CLAIMS

1. A spectrum enhancement system comprising:

a plurality of distributed filters, at least one of said filters for receiving a multi-frequency input signal;

a plurality of energy detection units, each of which is coupled to an output of at least one filter and each of which provides an energy detection output signal;

a weighted averaging unit that is coupled to each of said energy detection units and that provides a weighted averaging signal to each of said filters responsive to the energy detection output signals from each of said energy detection units.

2. The system as claimed in claim 1, wherein said weighted averaging signal is a non-linear signal.

3. The system as claimed in claim 1, wherein said plurality of energy detection units are coupled to the outputs of the filters via a plurality of differentiator units, each of which is coupled to an output of each of said filters and to one of said energy detection units.

4. The system as claimed in claim 1, wherein said differentiator units provide double differentiation.

5. The system as claimed in claim 1, wherein said energy detection units provide envelope detection.

6. The system as claimed in claim 1, wherein the multi-frequency signal is an auditory signal.

7. The system as claimed in claim 6, wherein said system is used with a cochlear implant.

8. The system as claimed in claim 1, wherein the multi-frequency signal is an electromagnetic signal.

9. The system as claimed in claim 1, wherein said weighted averaging signal is obtained by linear spatial filtering followed by a nonlinear unit.

10. A spectrum enhancement system comprising:

at least two filters h_j and h_{j+1} for receiving a multi-frequency input signal;

at least two energy detection units, each of which is coupled to an output of a filter and each of which provides an energy detection output signal e_j and e_{j+1} respectively; and

a weighted-averaging unit that is coupled to each of said energy detection units and that provides a weighted-averaging signal I_j to a non-linear unit responsive to each of said energy detection output signals e_j and e_{j+1};

said non-linear unit providing a resonant gain signal Q_j to said filter h_j responsive to said weighted-averaging signal I_j.

11. The system as claimed in claim 10, wherein said energy detection units are coupled to the outputs of the filters via a plurality of differentiator units, each of which is coupled to an output of each of said filters and to one of said energy detection units.

12. The system as claimed in claim 10, wherein said differentiator units provide double differentiation.

13. The system as claimed in claim 10, wherein said energy detection units provide envelope detection.

14. The system as claimed in claim 10, wherein the multi-frequency signal is an auditory signal.

15. The system as claimed in claim 14, wherein said system is used with a cochlear implant.

16. The system as claimed in claim 10, wherein the multi-frequency signal is an electromagnetic signal.

17. The system as claimed in claim 10, wherein said weighted-averaging signal is obtained by linear spatial weighting.

18. A spectrum enhancement system comprising:

a plurality of serially distributed low pass filters, the first of which receives a multi-frequency input signal;

a plurality differentiator units, each of which is coupled to an output of a low pass filter and each of which provides a differentiator output signal;

a plurality of energy detection units, each of which is coupled to an output of a differentiator unit and each of which provides an energy detection output signal;

a weighted averaging unit that is coupled to each of said energy detection units and that provides a weighted averaging signal to each of said low pass filters responsive to the energy detection output signals from each of said energy detection units.

19. A system as claimed in claim 18, wherein said differentiator units provide a double differentiator function.

20. A system as claimed in claim 18, wherein said differentiator units provide a unity differentiator function.

21. A method of providing spectral enhancement, said method including the steps of:

receiving a multi-frequency signal at a first low pass filter h_j and receiving an output of said first low pass filter at a second low pass filter h_{j+1};

providing a first energy detection signal e_j responsive to the output of said first low pass filter;

providing a second energy detection signal e_j responsive to the output of said second low pass filter;

providing a weighted averaging signal I_j to a non-linear gain unit responsive to each of said energy detection output signals e_j and e_{j+1}; and

providing a resonant gain signal Q_j to said low pass filter h_j responsive to said weighted averaging signal I_j.

22. The method as claimed in claim 21, wherein said method further includes the step of differentiating the output signals from each of said low pass filters h_j and h_{j+1}.